

CLAIMS

- 1 1. An alternator system having an alternating current (ac) voltage source controllable
2 by controlling a field current thereof, said ac voltage source having an output and an
3 internal inductance; the system comprising:
 - 4 a rectifier coupled to said ac voltage source;
 - 5 a sensor having an input coupled to one of said ac voltage source and an engine and
6 having an output;
 - 7 a control circuit coupled to said ac voltage source, said rectifier and said sensor,
8 said control circuit providing a first control signal to said rectifier and providing a second
9 control signal to said ac voltage source; and
 - 10 a fault protection controller having an input port coupled to an output of the
11 alternator system and having a first output port coupled to an input of said control circuit.
- 1 2. The alternator system of Claim 1 wherein said control circuit further comprises:
 - 2 a multiplexer having a first input coupled to a duty ratio signal, a second input
3 coupled to the first output port of said fault protection controller and an output; and
 - 4 a comparator having a first terminal coupled to said multiplexer output, a second
5 terminal coupled to a reference signal, and an output providing the first control signal.
- 1 3. The alternator system of Claim 1 wherein said first control signal comprises a
2 pulse width modulation (PWM) gate command.
- 1 4. The alternator system of Claim 3 wherein the PWM gate command is determined
2 by said fault protection controller.
- 1 5. The alternator system of Claim 3 further comprising:
 - 2 a field control circuit coupled to said alternating current (ac) voltage source; and
3 wherein the second control signal comprises a field controller command to the field

4 control circuit and wherein the gate command and the field controller command are
5 determined based on the alternator system output voltage and the sensor output.

1 6. The alternator system of Claim 5 wherein said fault protection controller further
2 comprises a second output port coupled to said field control circuit.

1 7. The alternator system of Claim 5 wherein said control circuit comprises a
2 compensator for receiving a desired output voltage and an actual output voltage and for
3 generating a control signal based on a desired output voltage and the actual output
4 voltage.

1 8. The alternator system of Claim 7 wherein said control circuit further comprises:
2 a limiter having an input coupled to the output of said compensator and having an
3 output coupled to an input of said field control circuit;
4 a controlled limiter for receiving a first input signal from said sensor and a second
5 input signal from said compensator and for providing a controlled limiter control signal at
6 an output thereof; and
7 a comparator adapted to receive a reference signal at a first input terminal, the
8 controlled limiter control signal at a second input terminal and for providing a comparator
9 output signal at an output terminal coupled to said switched-mode rectifier.

1 9. The alternator system of Claim 1 wherein said rectifier includes a transformer.

1 10. The alternator system of Claim 1 wherein said rectifier includes a diode bridge.

1 11. The alternator system of Claim 10 wherein said rectifier further includes a boost
2 switch set coupled to said diode bridge.

1 12. The alternator system of Claim 11 wherein said boost switch set comprises:

2 a controlled switch coupled to said control circuit; and
3 a diode coupled to said controlled switch.

1 13. The alternator system of Claim 1 wherein said rectifier comprises a switched
2 mode rectifier.

1 14. The alternator system of Claim 1 wherein said speed sensor senses at least one of:
2 (a) an ac voltage source speed;
3 (b) an ac voltage source frequency; and
4 (c) an ac voltage source back emf.

1 15. An alternator system for providing an output voltage level at an output port
2 thereof, the alternator system comprising:
3 an alternating current (ac) voltage source controllable by controlling a field
4 current thereof, said ac voltage source having an output and an internal inductance;
5 a rectifier coupled to said ac voltage source;
6 a sensor having an input coupled to one of said ac voltage source and an engine and
7 having an output;
8 a control circuit coupled to said ac voltage source, said rectifier and said sensor, said
9 control circuit for sensing an output voltage level at the output port of said alternator system
10 and for comparing the sensed output voltage to a reference value and for providing control
11 signals in response to the comparison;
12 a field controller coupled to said alternating current (ac) voltage source to control the
13 field current of said ac voltage source;
14 a limiter having an input coupled to the output of said compensator and having an
15 output coupled to an input of said field control circuit; and
16 a controlled limiter for receiving a first input signal from said sensor and a second
17 input signal from said compensator and for providing a controlled limiter control signal at
18 an output thereof.

1 16. The system of Claim 15 further comprising a fault protection controller having an
2 input port coupled to an output of the alternator system and having a first output port
3 coupled to an input of said control circuit.

1 17. The system of Claim 15 wherein said rectifier comprises a switched mode
2 rectifier.

1 18. The system of Claim 15 wherein said speed sensor senses at least one of:
2 (a) an ac voltage source speed;
3 (b) an ac voltage source frequency; and
4 (c) an ac voltage source back emf.

1 19. A system for charging a battery coupled to an output of a switching power
2 converter from a charging source having a positive terminal and a negative terminal, the
3 system comprising:
4 an ac machine coupled to an input of the switching power converter; and
5 a connecting means for selectively connecting the positive terminal of the
6 charging source to said ac machine.

1 20. The system of Claim 19 wherein the negative terminals of the charging source and
2 the battery are connected to system ground.

1 21. The system of Claim 19 wherein said charging source has a voltage level which is
2 less than the voltage level of the battery.